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Digital Mapping, Charting, and Geodesy Analysis Program Technical Review of Raster Product Format (RPF) and Scanned Map (SMap)

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13. Abstract *(Maximum 200 words).*

As part of its effort to adopt a triad of standards for vector, text, and raster data sets, the Defense Mapping Agency, via the Oceanographer of the Navy, has requested input from the Naval Research Laboratory's Digital Mapping, Charting, and Analysis Program (DMAP) regarding the Raster Product Format (RPF). This format is intended to satisfy the requirement for a raster standard, and to complement the already-existing Vector Product Format (VPF) and proposed Text Product Standard. In its evaluation, DMAP addresses several issues, ranging from specific editorial comments about the documents to more general comments on interoperability with other standards. DMAP reports that RPF, as a stand-alone format, is acceptable; however, from the triad point-of-view, RPF should more closely resemble the VPF, particularly with respect to metadata management. An implementation of the RPF, namely Scanned Map, is also analyzed by DMAP.

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Contents

Digital Mapping, Charting, and Geodesy Analysis Program Technical Review of Raster Product Format (RPF) and Scanned Map (SMap)

1.0 Introduction

This review discusses four documents: the Raster Product Format (RPF) standard [1] and its two companion documents on registered data values [2] and National Imagery Transmission Format (NITF) file integration [3]; and the Scanned Map (SMap) specification [4], formerly the Compressed ARC Digitized Raster Graphics (CADRG) specification. One of these documents, [3], has not changed since the Digital Mapping, Charting, and Geodesy Analysis Program (DMAP) last reviewed the RPF standard [5]. Therefore, the comments made in that review still apply.

For the most part, the RPF standard and its registered data values have improved as a stand-alone product format. Some corrections have been made, and the integration of the RPF into NITF is somewhat better. For example, the location section now records the addresses of sections relative to the beginning of the NITF message rather than the beginning of the RPF header section. The same is true for the color/grayscale offset records. Also, a component aggregate length field is now provided in the location section, which more closely resembles the NITF.

DMAP strongly recommends, however, that the eventual interoperability among the triad *Vector Product Format (VPF)/RPF/Text Product Standard* (TPS) be the driving force for further development of the raster standard. Since many products have been implemented in VPF, and that standard is in wide use, the RPF should emulate as much of VPF's structure as possible. How metadata is handled and how data are tiled are just a few of the issues that must be given more consideration. These topics and others were examined and documented in DMAP's previous technical review of RPF.

The final document, the SMap specification, is simply a renamed version of the CADRG specification. Few changes were made to the actual document.

2.0 List of Essential and Suggested Comments

The following list supplies comments classified as "essential" or "suggested." Page numbers and line/figure/table positions are given, as well as recommended alternate text.

KEY p = page l = line
t = table f = figure

2.1 Essential

RPF [1]

1. p. 7, l. 7,10 *Arc* should be the acronym *ARC* ("Equal Arc-Second Raster Chart/Map").

2. p. 20, l. 4 How does one distinguish between different boundary rectangles? This question was answered in the FIGURE 1 on p. 31 (reference each boundary rectangle by the lat/long vertices) in the specification dated 9 November 1993 but has been removed in this version. This detail needs to be addressed in both text (Section 5.1.3 on p. 19) and FIGURE 1.

3. p. 23, l. 6 The names of the mask tables should be consistent. Either use [transparent pixel mask table] or [transparency mask table] but not both interchangeably. Moreover, a more descriptive name for the [subframe mask table] would be the [empty subframe mask table], which is parallel to [transparent pixel mask table].

4. p. 30, l. 6 Generally speaking, the external table of contents file (containing offsets to RPF file components) has been retained even though NITF headers and RPF header files themselves hold much of this information. The only purpose of the table of contents file seems to be to allow the reading of an RPF file without having to know the NITF.

5. p. 47, f. 3 In line 33 (and other subsequent lines), "transparency mask table" is used. There should be a standard reference to this entity: "transparency mask table" or "transparent pixel mask table."

6. p. 66, l. 34 A reference to a section is missing. Most likely, the intended section is 5.1.2.2.

Registered Data Values for RPF [2]

7. p. 11, 10-11 DTED and the proposed CDTED (Compressed DTED) are gridded products which are no longer supported by RPF.

8. p. 21, l. 5 Specify in this table that VQ represents Vector Quantization.

2.2 Suggested

RPF [1]

9. p. 2, l. 22 The proper document is MIL-STD-2407, which will supersede MIL-STD-600006.

10. p. 11, l. 27 In Section 4.4.2.1, move "Note: ^ denotes exponentiation." above the first occurrence of the "^" symbol. Also, be consistent with subtraction spacing: second equation, "B - 1" on line 19.

11. p. 17, l. 35 "A central authority (i.e., DMA) shall assign each producer of RPF [frame file]s a block of <reference designator> 'numbers' for its exclusive use. Each producer shall be responsible for generating a <reference designator> value which, combined with a given <data series and zone>

shall make the [file name] unique for each [frame file]." Will this procedure be standard for other files in the VPF/RPF/TPS triad? If not, why was it incorporated into RPF only?

12. p. 20, l. 10 Different variables should be used to describe subframe size in sections 5.1.3.c.1 and 5.1.3.c.2 since N and M were used to describe frame size in 5.1.3.b.1 and 5.1.3.b.2. A figure (an example is given in Figure 1 of this review) showing the way in which frames and subframes are referenced within boundary rectangles is recommended.

13. p. 23, l. 20 The wording in this section, although technically correct, could be modified. A suggestion: If all subframes in the [frame file] are present and there are no transparent pixels in any of these subframes, then the [mask subsection] shall not be recorded.

14. p. 27, l. 29 MIL-STD-600006 will be superseded by MIL-STD-2407.

15. p. 31, l. 4 How does one determine a boundary rectangle? Is there a standard method?

16. p. 35, l. 27 A lower bound ("> = 10") is given for the size of each [component location record]. However, according to FIGURE 2, the size of this record is precisely 10. Similar bounds are given for other record lengths, but not consistently for all records. For instance, on page 52, line 40, another [component location record] is defined. Why is the minimum size not given in this example?

Registered Data Values for RPF [2]

17. p. 31, l. 1 This section lists valid datum codes currently registered for RPF products, whereas the RPF standard states on page 6, line 40 that the horizontal datum shall be WGS84 and the vertical datum shall be product dependent. Is the WGS84 stipulation a suggestion, or should the table of datum codes refer to vertical datum only?

3.0 Editorial Comments

All editorial comments are included in the following list.

RPF [1]

18. p. ii, l. 1 The contents section titles should be indented for ease of reading.

19. p. 8, l. 35 ' *"Var."* ' instead of ' *"var"*. ' is preferred; i.e., the period is placed inside the quote. There are other instances of this on page 16 line 16 and page 17 line 10.

20. p. 13, l. 17 Remove the space before "/" to avoid confusion with division.

21. p. 21, l. 10 *Use* should be *uses*.

22. p. 23, l. 20 This subsection should be labeled f, not e.

23. p. 26, l. 31 Remove the first occurrence of *be*.

24. p. 30, l. 24 There is an extra ")" symbol.

25. p. 41, l. 39 There is an extra ")" symbol.

26. p. 42, l. 30 Insert the word *values* after *pixel*.

27. p. 58, l. 37 The ending period is missing.

28. p. 59, l. 52 *Previously* should be *previous* or *previously defined*.

29. p. 60, l. 1 *Field*> should be *field*.

30. p. 62, l. 49 A ")" symbol is missing.

31. p. 64, l. 8 A ")" symbol is missing.

32. p. 65, l. 21 There is an extra ")" symbol.

SMap [4]

33. p. 22, l. 11 Remove the semicolon from the section title.

34. p. 47, l. 13 The section number 30.3.3 should be 30.3.2.

35. p. 82 Due to the changes in the CADRG specification, the current index is not up-to-date. For example, "areal extent" is now discussed on page 26.

36. p. 83, l. 10 The color/grayscale section is 3.12.5, not 2.12.5, and it is on page 23.

37. n/a This document needs an indented table of contents.

4.0 Recommendations

The "essential" comments noted above should be incorporated into the appropriate documents. These changes will improve the suite of standards composing RPF. In addition, the "suggested" comments need to be addressed before further advancement of the RPF. Finally, the editorial changes listed in this review under Section 3.0 should be made.

This analysis completes DMAP's second evaluation of RPF-related documents. Most of the suggestions from the previous RPF review [5] were adopted. However, the recommendations concerning RPF's relationship to VPF-type layers in a Global Geospatial Information and Services initiative were not adopted. Moreover, DMAP recommends additional consideration be given to other unaddressed topics raised in the previous review, namely, the RPF tiling scheme, remotely sensed data, and the Spatial Data Transfer Standard.

5.0 Acknowledgments

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Technical review of this report was provided by Mr. Mike Harris and Ms. Maria Kalcic, both of the NRL Mapping, Charting, and Geodesy Branch, and Ms. Mary Clawson of the NRL Marine Geosciences Division.

6.0 References

1. Defense Mapping Agency, *Draft Military Standard Raster Product Format*, MIL-STD-2411, 27 December 1993.

2. Defense Mapping Agency, *Draft Military Standard Registered Data Values for Raster Product Format*, MIL-STD-2411-1, 22 December 1993.

3. Defense Mapping Agency, *Draft Military Standard Integration of Raster Product Format Files into the National Imagery Transmission Format*, MIL-STD-2411-2, 22 December 1993.

4. Defense Mapping Agency, *Draft Military Specification Scanned Map (SMap)*, MIL-S-89038, 22 December 1993.

5. Shaw, Kevin, et al. *Digital Mapping, Charting, and Geodesy Analysis Program Technical Review of Raster Product Format (RPF)*, NRL Memorandum Report, MR/7441--94-7546.

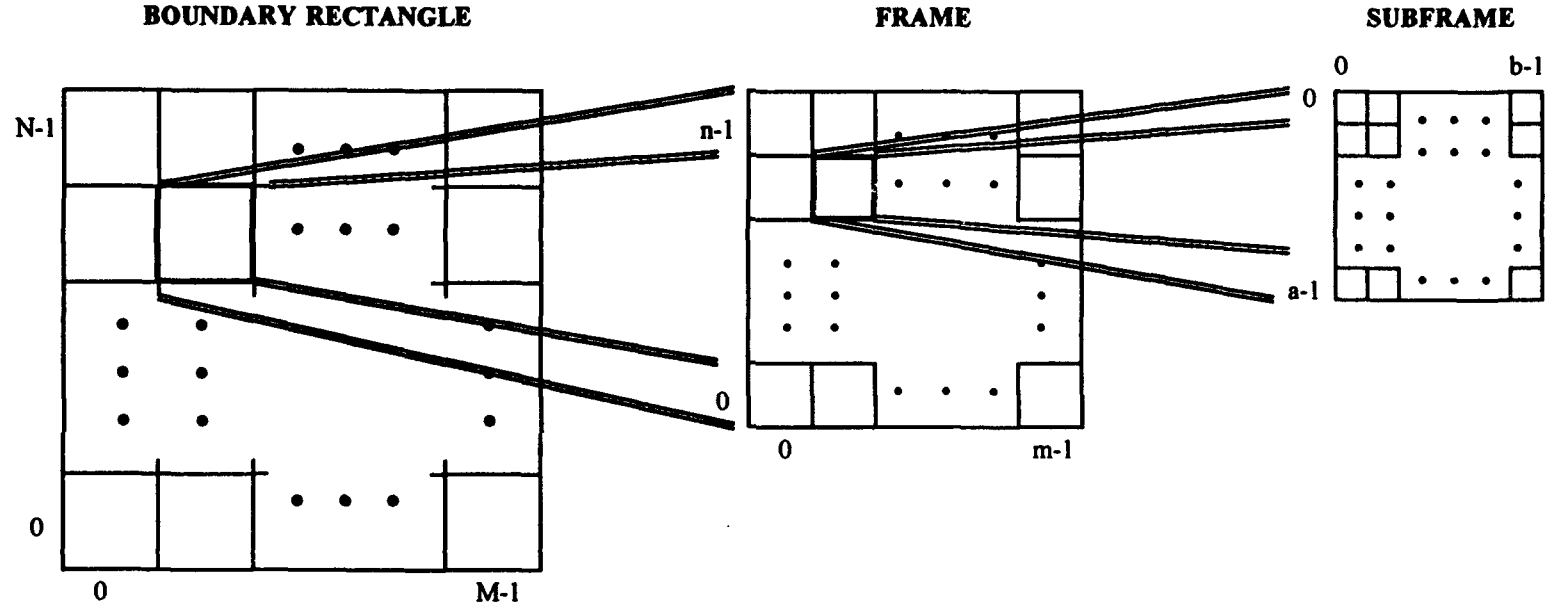

Figure 1. Example diagram showing boundary rectangle, frame, and subframe referencing

Appendix. Acronyms.

CADRG	Compressed ARC Digitized Raster Graphics
CDTED	Compressed Digital Terrain Elevation Data
DMAP	Digital Mapping, Charting, and Geodesy Analysis Program
DTED	Digital Terrain Elevation Data
GGIS	Global Geospatial and Information Services
NITF	National Imagery Transmission Format
NRL	Naval Research Laboratory
RPF	Raster Product Format
SMap	Scanned Map
TOWS	Tactical Oceanographic Warfare Support
TPS	Text Product Standard
VPF	Vector Product Format
WGS84	World Geodetic System 1984